IMPULSE RESPONSE MEASUREMENTS IN THE 1850-1990 MHz BAND IN LARGE OUTDOOR CELLS

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Mobile impulse response measurements were taken in the 1850-1990 MHz band in three different macrocellular (cell radii of 5 km) environments: flat rural, hilly rural, and urban high-rise. Spatial diversity with a 15-wavelength separation was employed by using a dual-channel receiver. All antennas were omnidirectional and vertically polarized. The data were analyzed to provide delay statistics; spatial diversity statistics; multipath power statistics; number of paths, path arrival time, and path power statistics; and correlation bandwidth statistics. The urban high-rise cell showed more multipath components (out to 4 or 5 μs in delay) than the rural cells. Very long delays (greater than 10 μs), while not seen often, were seen more frequently in the rural cells than in the urban high-rise cell. Parameters to help design a tapped delay model of the radio channel in the different environments are given.

Key words: *arrival time, channel model, coherence bandwidth, correlation bandwidth, impulse response, multipath, power delay profiles, RMS delay spread, spatial diversity, tapped delay model, wideband measurements*

1. INTRODUCTION

The impulse response of the radio propagation channel is of great importance in the design, development, and planning of radio systems since it completely describes the radio propagation channel. Once the impulse response of a channel is known, the actual received signal can be determined given a specific transmitted signal by convolving the transmitted signal with the impulse response. Modelling of the impulse response has been and will continue to be an important effort, as will be hardware and software simulation utilizing impulse responses. Additionally, there have been many attempts made throughout the years to correlate the performance of radio systems through a propagation channel using analytical methods with measured impulse responses. Impulse response measurements are therefore needed to support the ongoing channel modelling and simulation efforts as well as to support analytical methods required in the development of new telecommunication services such as Personal Communication Services

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(PCS) and advanced cellular mobile systems. This paper addresses this need by discussing a set of impulse response measurements taken in the 1850-1990 MHz band.[**]

The impulse response measurements presented in this paper were taken in three different cell environments in the Denver, Colorado, area. These environments included a flat rural cell, a hilly rural cell, and an urban high-rise cell. The measurements within each cell were made using a fixed-location receiver placed at the center of the cell and a mobile transmitter installed in a measurement van. All of the measurements were made within a 5-km radius of the center of each cell, using omnidirectional, vertically polarized transmit and receive antennas. Impulse response data were collected as the transmitter van travelled along predetermined routes within each cell. The data were analyzed to provide delay statistics; spatial diversity statistics; multipath power statistics; number of paths, path arrival time, and path power statistics; and correlation bandwidth statistics.

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